

## Experimental Analysis of Automatic Disc Braking System

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### Abstract

*The main objective of this project is for security system. If vehicle moves very near to the opposite vehicle then it applies brake automatically. It is used for avoiding accident over by racing in highways and parking or busy traffic areas through pneumatic braking. Pneumatic braking system works faster when compared to other devices. So we can achieve the high efficient operation by programming the microcontroller. The circle brake is a gadget for abating or ceasing the turn of a wheel. Contact causes the plate and joined wheel to moderate or stop. Brakes change over grating to warm, however in the event that the brakes get excessively hot, they will stop, making it impossible to work since they can't disseminate enough warmth. This state of disappointment is known as brake blur. Circle brakes are presented to extensive warm worries amid routine braking and uncommon warm worries amid hard braking.*

### INTRODUCTION

A brake is a gadget by methods for which counterfeit frictional resistance is connected to moving machine part, with a specific end goal to stop the movement of a machine. During the time spent playing out this capacity, the brakes retain either active vitality of the moving part or the potential vitality surrendered by articles being brought down by derricks, lifts and so forth. The vitality consumed by brakes is dispersed as warmth. Circle brake is recognizable car application where they are utilized widely for auto and bike wheels. This is sandwiched between two cushions activated by cylinders upheld in a caliper mounted on the stud shaft. At the point when the brake lever is squeezed using pressurized water pressurized liquid is constrained into the barrels pushing the contradicting cylinders and brake cushions into frictional contact with the circle. Friction brakes act by producing frictional strengths as at least two surfaces rub against each other.

The ceasing force or limit of a grating brake relies on upon the region in contact

and coefficient of erosion of the working surfaces and in addition on the incitation weight connected. Wear happens on the working surfaces, and the solidness of a given brake (or administration life between support) relies on upon the kind of contact material utilized for the replaceable surfaces of the brake. In the event that drake plate are in strong body the Heat exchange rate is low. Time taken for cooling the circle is low. If brake plate are in strong body, the region of contact amongst Disk and Pads are all the more, so productivity of brake is high. We presented superimpose variety cut example on the circle in plate brake. The quantity of cuts Pattern present in plate The Heat exchange rate is increment. Time taken for cooling the circle is high. In the event that the quantity of cut is increment in the circle, the zone of agreement between the plate and cushions were lessens, so proficiency of brake is high.

The quantity of cut was increment the quality of the plate likewise lessens. So it can without much of a stretch break. So the quantity of cuts in the circle with in the

breaking point, It can Heat exchange rate of the plate and the zone of contact amongst Disk and Pads are not diminishes and proficiency of brake must be same.

### LITERATURE SURVEY

Floquet et al (2009) determined of temperature dissemination and examination of reproduction results and trial brings about the plate by 2D warm investigation utilizing axisymmetric display. The disc brake used in the automobile is divided into two parts; a rotating axisymmetrical disc, and the stationary pads. The friction heat, which is generated on the interface of the disc and pads, can cause high temperature during the braking process.

The impact of introductory speed and deceleration on cooling of the brake circle was likewise researched. The warm reproduction is utilized to portray the temperature field of the circle with suitable limit conditions. A Finite-component technique was created for deciding the basic sliding pace for thermo flexible flimsiness of an axisymmetric grasp or brake. . Straight annoyances on the consistent speed arrangement were looked for that shift sinusoid partner in the circumferential course and develop exponentially in time.

These variables scratch off in the overseeing thermo versatile and warm conduction conditions, prompting to a direct eigen value issue on the two dimensional cross-sectional area for the exponential development rate for every Fourier wave number. The nonexistent piece of this development rate compares to a relocation of the bother in the circumferential course. The calculation was tried against an investigative answer for a layer sliding between two half-planes and gave fantastic assertion, for both the basic speed and the ,relocation speed.

Criteria were produced to decide the work refinement required to give a sufficient discrete portrayal of the warm limit layer neighboring the sliding interface. The strategy was then used to decide the insecure mode and basic speed in geometries approximating current multi-circle grip hone.

R. A. Burton et al (2008) showed the warm disfigurement in frictionally warmed contact wheel-mounted on circle brakes were presented to extreme non-symmetrical mechanical and warm loads. The paper depicted the plan procedure for two elite, hubmounted plates of various size and obligation.

The improvement was brought about two extremely fruitful yet in a general sense diverse center point outlines and assembling strategies. At first, limited component investigations utilized as a part of the plan improvement were basically focused on mass warm impacts. As of late, all together further to enhance the plan 5 prepare, examinations had included full scale warm impacts, giving important outcomes, especially identified with the forecast of circle lasting coning, a standout amongst the most basic outline necessities. At whatever point erosion happens in dry sliding of mechanical segments, mechanical vitality is changed into warmth through surface and volumetric procedures in and around the genuine zone of contact. This frictional warming, and the warm and thermo mechanical wonders related with it, can impact the conduct of the sliding segments, particularly at high sliding speeds.

Huge advancements in the investigation of these marvels were audited. Among the points investigated were systems of frictional warming and the circulation of warmth amid sliding grating, the estimation and examination of surface and close surface temperatures coming about

because of frictional warming, warm distortion around sliding contacts and the adjustments in contact geometry brought on by warm disfigurement and thermo versatile insecurity, and the thermo mechanical anxiety conveyance around the frictionally warmed and thermally twisted contact spots. The paper closes with a dialog of the impact of the warm and thermo mechanical contact marvels on wear, thermo breaking and different methods of disappointment of sliding mechanical segments. T. A. Dow et al (2012) proposed to add to dynamic and warm examination of the braking wonder.

A dynamic model was built up. Utilizing this model the condition of movement of an auto was determined for straight line braking. In this specific situation, firstly the weights varieties in the brake pressure driven circuit versus pedal constrain were resolved. A short time later, the expression for grinding torques and related braking power initiated by water driven weight was considered, and substituted into the condition of movement of vehicle. In its last shape, this condition was numerically tackled by methods for the new check reconciliation plot; thus, the separation went via auto until ceasing, alongside its speed and deceleration, was registered. At last, a warm examination in the brake plates and drum was done. A fantastic assertion amongst numerical and test outcomes was watched. Likewise, ideal weight values for which the back tire don't go to lockup was gotten.

K.Lee et al (2007) thermo versatile shakiness in a car plate slowing mechanism was examined tentatively under drag braking conditions. The onset of precariousness was obviously identifiable through the perception of non-consistencies in temperature 6 measured utilizing installed thermocouples. A dependability limit was built up in temperature/speed space, the basic

temperature being owing to temperature reliance of the brake cushion material properties. It was likewise found that the type of the subsequent insecure irritations or Eigen capacities changes relying on the sliding pace and temperature. A limited component technique was created for deciding the basic sliding rate for thermo versatile unsteadiness of a hub symmetric grip or brake. Straight irritations on the consistent speed arrangement were looked for that change sinusoid partner in the circumferential heading and develop exponentially in time. These variables drop in the administering thermo flexible and warm conduction conditions, prompting to a direct Eigen esteem issue on the two-dimensional cross-sectional space for the exponential development rate for every Fourier wave number.

The fanciful piece of this development relocation of the annoyance in the circumferential course. The calculation was tried against an explanatory answer for a layer sliding between two half-plane and gave amazing understanding, for both the basic speed and the relocation speed. Criteria were produced to decide the work refinement required to give a satisfactory discrete depiction of the warm limit layer neighboring the sliding interface. The strategy was then used to decide the unsteady mode and basic speed in geometries approximating current multi-plate grasp hone.

## **MECHANICAL MODELING INTRODUCTION**

CATIA V5 is mechanical design software, addressing advanced process centric design requirements of the mechanical industry. With its feature based design solutions, CATIA proved to be highly productive for mechanical assemblies and drawing generation. CATIA is a broad range of integrated solutions for all manufacturing organization. CATIA is the best solution capable of addressing the

complete product development process, from product concept specification through product service in a fully integrated and associative manner. CATIA mechanical design solutions provide tools to help you implement a sophisticated standard based architecture. This enables collaborative design and offers digital mockups and hybrid designs.

The domain includes:

- Product design & manufacturing.
- Drawing enterprise competitiveness
- Task presentation

CATIA V5 is totally compliant with windows presentation standards. CATIA V5 provides a unique two way interoperability with CATIA version4 data. As an open solution, CATIA includes with the most commonly used data exchange industry standards. CATIA V5 R17 extends the power of leading edge engineering practices to include relation design, which results in,

- Higher Quality design
- More opportunities for innovation
- Fewer engineering changes

### **SKETCHER**

CATIA sketcher tools initially drafts a rough sketch following the shape of the profile. The objects created are converted into a proper sketch by applying geometric constraints and dimensional constraints. These constraints refine the sketch according to a rule. Adding parametric dimensions further control the shape and size of the feature. Pad, groove, slot etc., are used as one of the feature creation tools to convert the sketcher entity into a part feature.

**PART DESIGN** The CATIA V5 is a 3D parametric solid modeler with both part and assembly modeling abilities. You can use CATIA to model simple parts and then combine them into more complex assemblies. With CATIA, you design a part by sketching its component shapes and defining their size, shape, and inter

relationships. By successively creating these shapes, called features, you can construct the part.

The general modeling process:

- Planning concept of designing
- Creation of base feature
- Completion of other features
- Analyzing the part design
- Modifying the design as necessary

### **ASSEMBLY DESIGN CATIA**

Assembly design gives the user the ability to design with user controlled associability. CATIA builds individual parts and subassemblies into an assembly in a hierarchical manner according to the relationships defined by constraints. As in part modeling, the parametric relationships allow you to quickly update an entire assembly based on a change in one of its parts.

The general assembly process-

- Layout the assembly
- Based on design follow either top down or bottom up
- Analyze the assembly
- Modifying the assembly

### **DRAFTING**

Drawings and documentation are the genuine results of plan since they manage the produce of a mechanical gadget. CATIA consequently create cooperative drafting from 3D mechanical originators and assemblies. CATIA improves Generative Drafting with both coordinated 2D intelligent usefulness and a profitable situation for drawings spruce up and explanation.

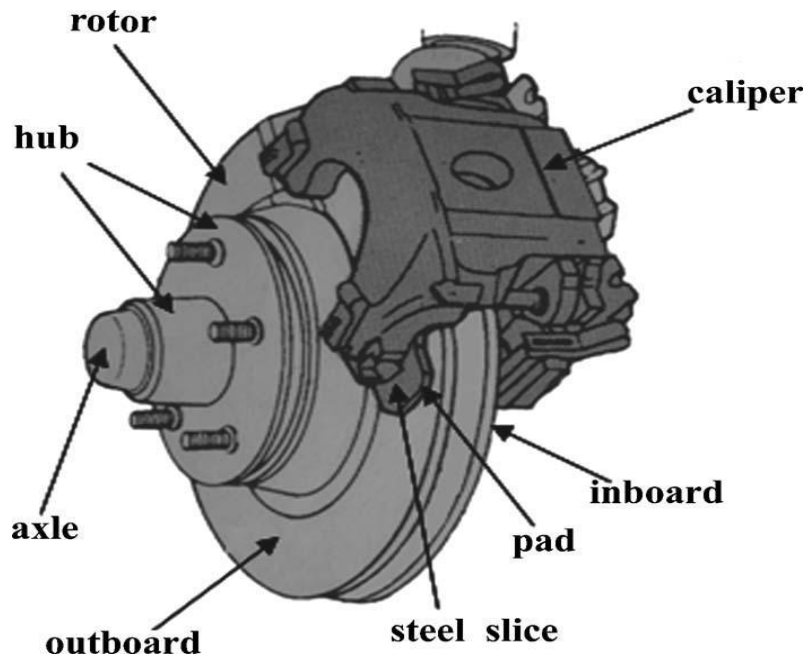
### **DESCRIPTION OF EQUIPMENTS DISC BRAKE**

A plate brake comprises of a cast press circle dashed to the wheel center and a stationary lodging called caliper. The caliper is associated with some stationary piece of the vehicle like the hub packaging or the stub hub as is shown in two



sections each part containing a cylinder. In the middle of every cylinder and the circle there is a grating cushion held in position by holding pins, spring plates and so forth

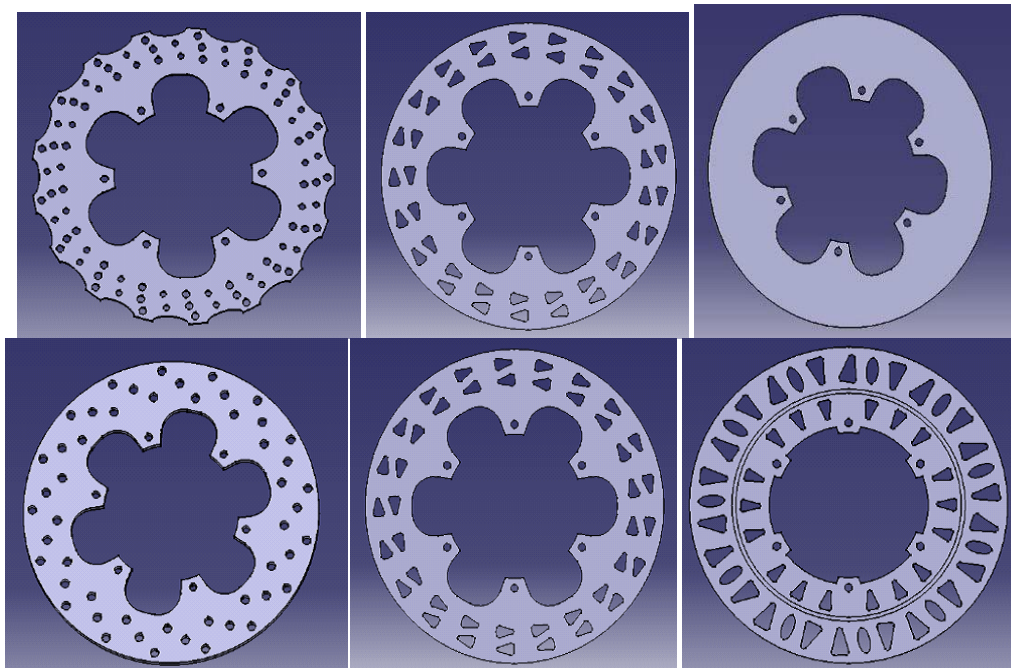
sections are penetrated in the caliper for the liquid to enter or leave each lodging. A schematic diagram is shown in the figure 3.1.



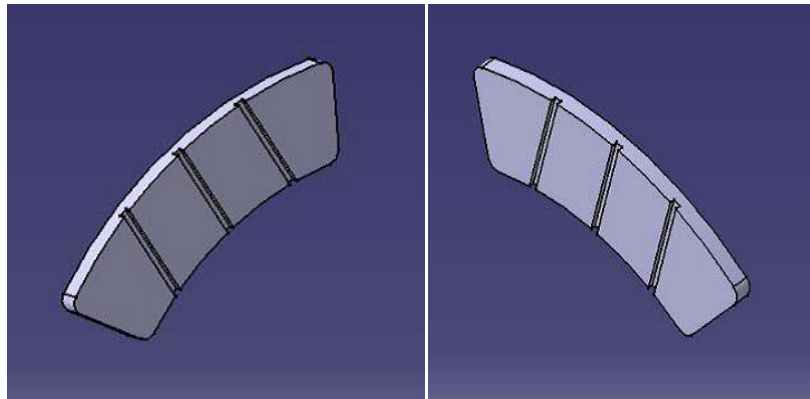
*Fig 3.1 Disc Brake*

The main components of the disc brake are:

- The Brake Pads
- The Caliper which contains the piston
- The Rotor, which is mounted to the hub



*Fig 3.2 Types of Disc*



**Fig 3.3** Disc Pads

At the point when the brakes are connected, using pressurized water activated cylinders move the erosion cushions into contact with the pivoting plate, applying equivalent and inverse powers on the circle. Because of the contact in the middle of circle and cushion surfaces, the active vitality of the turning wheel is changed over into warmth, by which vehicle is to stop after a specific separation. On discharging the brakes the brakes the elastic fixing ring goes about as return spring and withdraw the cylinders and the contact cushions far from the plate.

#### **SWINGING CALIPER DISC BRAKE**

The caliper is pivoted about a support stick and one of the grinding cushions is settled to the caliper. The liquid underweight presses the other cushion against the circle to apply the brake. The response on the caliper causes it to move the settled cushion internal somewhat applying meet weight to the opposite side of the cushions. The caliper consequently modifies its position by swinging about the stick.

#### **SLIDING CALIPER DISC BRAKE**

These are two cylinders between which the liquid under weight is sent which squeezes one contact cushion specifically on to the circle where as the other cushion is passed in a roundabout way through the caliper.

#### **PROBLEMS IN DISC BRAKE**

Grating brakes act by producing frictional strengths as at least two surfaces rub against each other. The halting force or limit of an erosion brake relies on upon the zone in contact and coefficient of grinding of the working surfaces and also on the activation weight connected. Wear happens on the working surfaces, and the strength of a given brake (or administration life between support) relies on upon the kind of grinding material utilized for the replaceable surfaces of the brake.

In the event that drake circle is in strong body the Heat exchange rate is low. Time taken for cooling the circle is low. In the event that brake circle are in strong body, the zone of contact amongst Disk and Pads are all the more, so productivity of brake is high.

We presented superimpose variety cut example on the circle in plate brake. The quantity of cuts Pattern present in circle The Heat exchange rate is increment. Time taken for cooling the circle is high. On the off chance that the quantity of cut is increment in the plate, the zone of agreement between the circle and cushions were decreases, so productivity of brake is high. The quantity of cut was increment the quality of the plate likewise diminishes. So it can without much of a stretch break. So the quantity of cuts in the

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## OBJECTIVE OF THE PRESENT STUDY

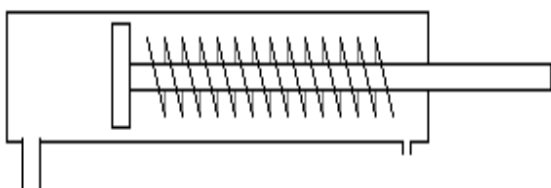
The present investigation is aimed to study:

- The given disc brake of its stability and rigidity (for this Thermal
- Analysis and structural analysis is carried out on a given disc brake.
- Best combination of parameters of disc brake like Cutting pattern in disc and material there by a best combination is suggested.
- And the best combination of parameters of disc brake is optimistic by a best is suggested.

## PNEUMATIC CYLINDER

Pneumatic cylinders are mechanical gadgets which utilize the force of compacted gas to create a drive in a responding direct movement.

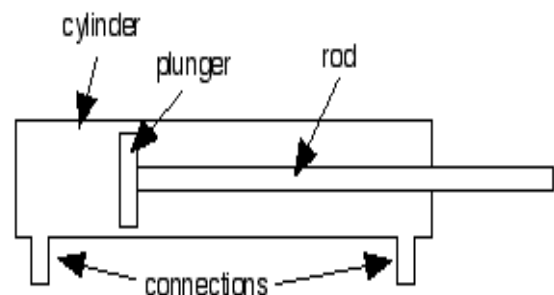
Like water powered chambers, something powers cylinder to move in the coveted bearing. The cylinder is a plate or barrel, and the cylinder bar exchanges the drive it creates to the protest is moved. Engineers here and there like to utilize pneumatics since they are calmer, cleaner, and don't require a lot of space for liquid stockpiling. Because the operating fluid is a gas, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement



*Fig 3.4 Pneumatic Cylinder*

## AIR CYLINDERS

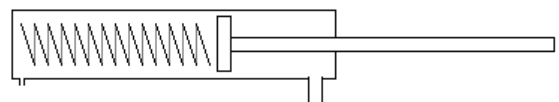
There are just two fundamental sorts of air barrels: Double acting, and single acting. They come in all varieties, shapes and sizes. Both sorts are valuable for frequent work. Twofold acting chambers are valuable when you have to push in both headings, and single acting barrels are helpful when just a push in one course is required. What's more, here and there 'when there's no other option', you can adjust a twofold to go about as a solitary, and a solitary to go about as a twofold.



*Fig 3.5 Cylinder Diagram*

## SINGLE ACTING CYLINDER

Single Acting means the air chamber pole is just pushed in a solitary course, either out or in. There is just a single association for air, and a little gap in the flip side to give air access and out. A spring is utilized to push the pole the other way after pneumatic force is removed. Single Acting Air Cylinder, with the pole regularly out without weight



*Fig 3.6 Cylinder Without Pressure*



**Fig 3.7** Cylinder With Pressure

As air is pushed into the connection, the plunger begins to move and compress the spring. Exhaust air exits out the exhaust hole on the other end. When air is released, it exits out the connection, and air is sucked into the exhaust hole as the spring pushes the plunger back to its resting position. Basically, the spring is 'push' needed to return the plunger and rod back to their starting position.

When selecting a cylinder for an application, remember that a double acting cylinder pushes in both directions, while a single acting cylinder only pushes in one direction.

### MOUNTING

There are about as many ways to mount an air cylinder as there are different types of air cylinders. Again, this is because of all the uses. Clevis mounts give the greatest amount of movement, flexibility, and ease of mounting over other mounts.

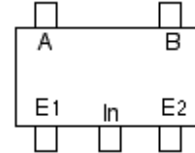
### SOLENOID VALVES

Here's the most befuddling some portion of managing pneumatics – solenoids. Much the same as air barrels, they come in all sizes, styles, shapes, sizes, and blends. There's actually something for everybody with regards to solenoids.

The entire 'four port ', 'five ports', 'two way', 'three way', naming originated from the activity of the air as it travels through the solenoid. Once more, the names aren't

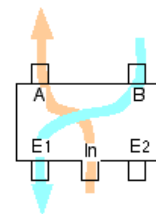
as essential as what it does. The best blend of adaptability and use for twofold acting barrels is what's known as a "five port, four way" solenoid (they're additionally called 'valves').

### FIVE PORT, FOUR WAY SOLENOID



**Fig 3.8** Solenoid valve

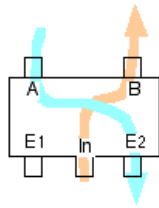
A five port solenoid has just that - five connections called ports. Usually, they are labeled A, B, E1, E2, and In. There are variations of this too. In most cases, any pair of ports that have a label that has an 'A & B', '1 & 2', 'A1 & A2' - that's the ports that connect to the air cylinder. Exhaust ports almost always have an 'E' in the name. There is almost always a single 'In'. Notice the phrase 'almost always' - that's because there are cases where solenoids have several sets of in's and out's to fill a particular application. Thus is the 'five port' part.



**Fig 3.9** Solenoid off

The 'four way' term describes the paths that air can take when the solenoid is in operation. Use the drawing to follow this description. When a four way solenoid is 'off' or 'de-energized', air will flow through from the In to the A port (that's one way), and also let out of port B through port E1 (two ways). So air goes in through the In port, and out the A port to push the cylinder, and it lets air out of port B (through E1).

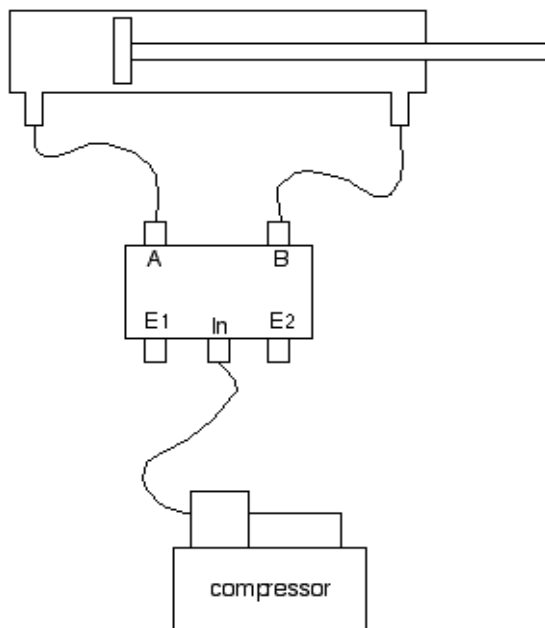




**Fig 3.10 Solenoid on**

Also, when the solenoid is 'on', (invigorated), pneumatic force from the In port streams to the B port (the third way), and fumes air is let out of port A through port E2 (the fourth way).

A critical normal for the 5 port, 4way solenoid is called "opening" size. This is the extent of the inside air ways through the solenoid. It's as a rule cited is measurement. A hole of no less than 1/8" is prescribed, with a size of 1/4" favored. The hole estimate straightforwardly influences the solenoids wind stream. The more air it can move, the speedier an air barrel can move. Four port, Four route variety of the five port, four way consolidates the two fumes ports into one single fumes. So it is known as a four port.



**Fig 3.11 Double acting air cylinder connected to 5 Port, 4 Way solenoid**

## FITTINGS

There are two very useful fittings: Push-in (or Push-on), and quick-connect. The quick-connect are the standard fittings seen mostly at a gas station. They are extremely useful to 'quickly' connect and disconnect air to props. The Push-in connectors are very useful to connect solenoids to air cylinders. Both of these connector types are highly recommended.

## REGULATORS AND FILTERS

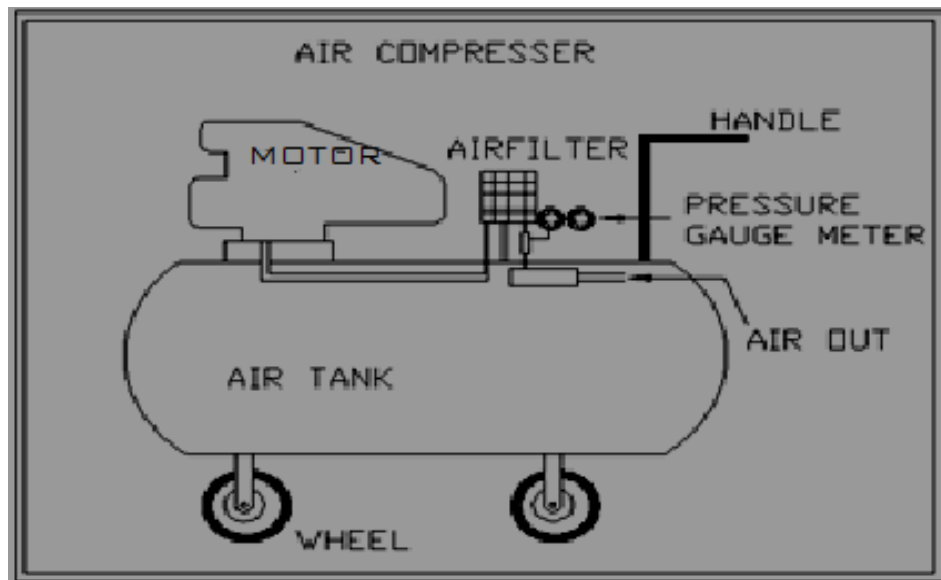
Most air frameworks incorporate air controllers, molecule channels, water channels, and manual valves to convey great air to the solenoids and air cylinders. The most vital of these is the air controller. This unit sets the general weight for your air framework. A decent beginning weight to run a couple popups is 60 psi or less. In case you're supporting a vast air framework with loads of popups and long aircrafts, 70-80 psi is not over the top. In any case, weights past 80 psi will start to "stress" the whole framework, and show itself in little breaks around fittings, wear and tear of popup systems, and long running circumstances for the compressor. You may also consider having several regulators in your air system. This gives you the option of optimizing just the right amount of air to each place. For example, a jumper popup may only need 30psi to work. Running it on your 60 psi system will eventually wear it out. Placing a regulator just before the jumper's solenoid lets you reduce air pressure and just give the jumper what it needs to run.

Particle and water filters are useful items to use to keep your air lines free from debris and moisture. Debris will clog air lines, solenoids and cause erratic or intermittent operation. Moisture in the air will cause rust to form. There are also lubricators that add a small amount of oil to the air to keep the mechanics working smoothly.

### AIR COMPRESSOR

Compressor is the air delivering machine. They gather the pretense from the air are in the running of machine are motor. Air compressors are used to raise the weight of a volume of air. Air compressors are accessible in numerous setups and will work over an extensive variety of stream rates and weights. Compacted air was removed by primitive man to give sparkling coals adequate oxygen to permit them to erupt into a fire. Amid the pressure procedure, the temperature increments as the weight increments. This is known as polytypic pressure. The measure of pressure power additionally increments as the temperature increments. Compressors are organized accordingly lessening the temperature rise and enhancing the pressure proficiency. The temperature of the air leaving each stage is cooled preceding entering the following stage. This cooling procedure is called intercooling. Volumetric productivity additionally increments with multi-arrange pressure since the weight proportion over

the main stage will be diminished. Choice of the air compressor is just the initial phase in planning a proficient and solid compacted air framework. The air leaving the compressor is immersed with dampness and will have compressor greases (greased up compressors as it were). Different chemicals that may have been drawn into the compressor admission may likewise be available. This defilement is hurtful to many procedures, pneumatic apparatuses, instruments and hardware. Air sanitization gear, channels, air dryers, breathing air purifiers, checking hardware, utilized alone or in mix will expel these contaminants. Choice and buy of the compressor and essential filtration hardware can be effectively done on the Compressed air site. Our application designers are prepared to answer the greater part of your inquiries and to help you in submitting your request. What's more, it work during the time spent turning the fan and the cylinder development with the assistance of current supply.



*Fig 3.12 Air Compressor*

### CONTROL UNIT

In our project the main device is a micro controller. It is used to control the whole unit of this project. The micro controller is

connected to the control unit. The control unit is connected with the battery to get the power supply.

Microcontrollers are destined to play an increasingly important role in revolutionizing various industries and influencing our day to day life more strongly than one can imagine. Since its emergence in the early 1980's the microcontroller has been recognized as a general purpose building block for intelligent digital systems. It is discovering utilizing differing region, beginning from basic youngsters' toys to profoundly complex rocket. In view of its flexibility and many favorable circumstances, the application space has spread in every single possible course, making it universal. As a result, it has produce a lot of intrigue and energy among understudies, educators and honing engineers, making an intense training requirement for granting the learning of microcontroller based framework plan and advancement. It recognizes the essential components in charge of their colossal effect; the intense instructive need made by them and gives a look at the significant application zone.

### **ADVANTAGES OF MICROCONTROLLERS**

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### **SCHEMATIC EXPLANATION**

On the off chance that a framework is created with a chip, the creator needs to go

for outside memory, for example, RAM, ROM or EPROM and peripherals and subsequently the extent of the PCB will be sufficiently substantial to hold all the required peripherals. Be that as it may, the small scale controller has got all these fringe offices on a solitary chip so advancement of a comparative framework with a miniaturized scale controller lessens PCB size and cost of the design. One of the significant contrasts between a smaller scale controller and a microchip is that a controller frequently manages bits , not bytes as in this present reality application, for instance switch contacts must be open or close, markers ought to be lit or dull and engines can be either turned on or off et cetera.

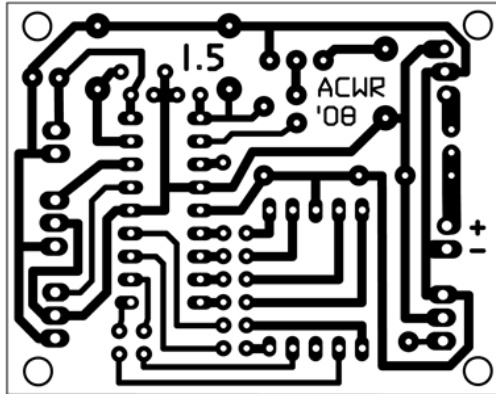
This circuit is intended to control the heap. The heap might be engine or some other load. The heap is turned ON and OFF through hand-off. The transfer ON and OFF is controlled by the match of exchanging transistors (BC 547). The hand-off is associated in the Q2 transistor authority terminal. A Relay is only electromagnetic exchanging gadget which comprises of three pins. They are Common(3rd stick), Normally close (fifth stick) and Normally open (fourth stick).

The hand-off basic stick is associated with supply voltage. The regularly open (NO) stick associated with load. At the point when high(5 volt) beat flag is given to base of the Q1 transistors, the transistor is leading and shorts the authority and emitter terminal and zero(0 Volt) signs is given to base of the Q2 transistor. So the hand-off is killed state.

At the point when low heartbeat is given to base of transistor Q1 transistor, the transistor is killed. Presently 12v is given to base of Q2 transistor so the transistor is directing and hand-off is turned ON. Henceforth the normal terminal and NO terminal of transfer are shorted. Presently

stack gets the supply voltage through hand-off.

### PCB LAYOUT



*Fig 3.13 PCB Layout*

### RELAY

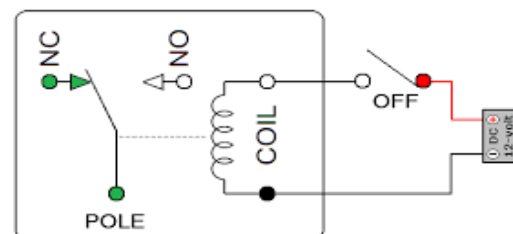
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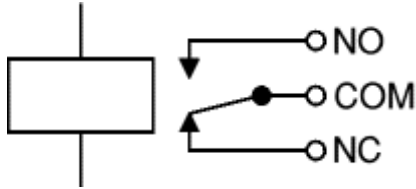


*Fig 3.14 Relay*

Transfers are generally SPDT or DPDT however they can have numerous more arrangements of switch contacts, for instance transfers with 4 sets of changeover contacts are promptly accessible. Most transfers are intended for PCB mounting however you can weld wires specifically to the pins giving you take care to abstain from liquefying the plastic instance of the hand-off. The vivified picture demonstrates a working transfer with its curl and switch contacts. You can see a lever on the left being pulled in by attraction when the curl is exchanged on. This lever moves the switch



contacts. There is one arrangement of contacts (SPDT) in the frontal area and another behind them, making the transfer DPDT.



*Fig 3.15 Relay Working*

The relay's switch connections are usually labeled COM, NC and NO:

- **COM** = Common, always connect to this, it is the moving part of the **switch**.
- **NC** = Normally Closed, COM is connected to this when the relay coil is **off**.
- **NO** = Normally Open, COM is connected to this when the relay coil is **on**.

## RELAY DATA SHEET

*Table 3.1 Relay Data Sheet*

CLASSIFICATION		PCB RELAY
Product Model		JQC-3F(T73)
Outline Dimension(L×W×H) (mm)		19×15.5×15.5(mm)
Contact Form		1Z,1H,1D
Contact Resistance		100mΩ (1A 6VDC)
Coil Voltage		3VDC~48VDC
Operate Time (at nomi. Volt)		15ms
Release Time (at nomi. Volt)		10ms
Coil Power(W)		0.36
Contact Rating		7A/10A 250VAC 10A/15A 28VDC 10A/15A 120VAC
Insulation Resistance		1000MΩ,500VDC
Dielectric Strength	Between Open Contact	500VAC
	Between Coil and Contact	750VAC
Electrical Life		1×10 <sup>5</sup>
Mechanical Life		1×10 <sup>7</sup>
Max. Switching Voltage		250VAC/30VDC
Max. Switching Current		15A
Max. Switching Power		300W/2500VA
Impact Resistance		Stability 100m/s <sup>2</sup> Intensity 1000m/s <sup>2</sup>
Humidity		35%~95% R.H.
Temperature Range		-40~+80°C
Vibration Resistance		1mm 10~55Hz
Mounting Form		PCB Terminal
Weight		9g
Construction		Sealed IP67

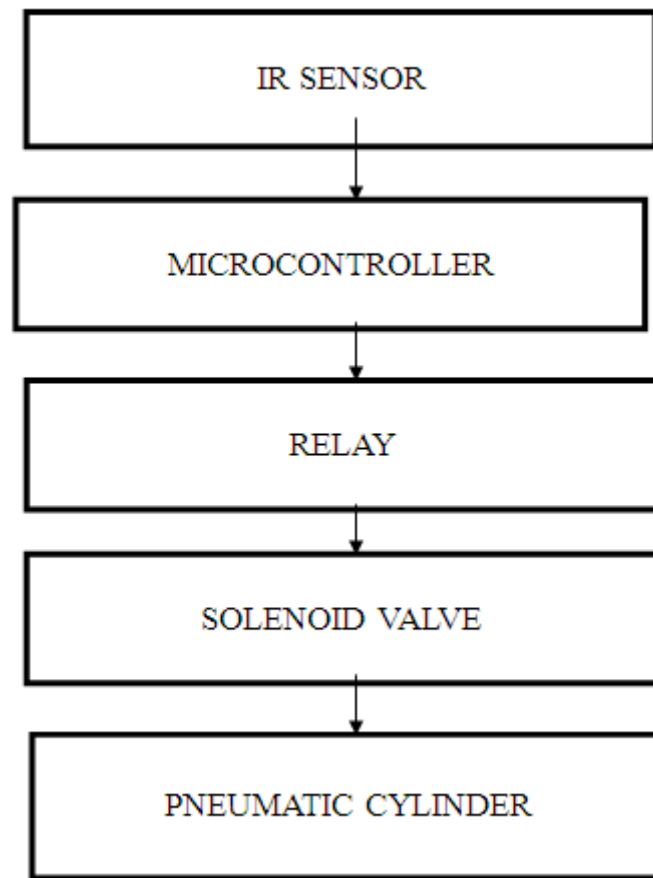
## DESIGN OF EQUIPMENT AND DRAWING

### ELECTROMAGNETIC BRAKE COMPONENTS AND ITS SPECIFICATION

The electromagnetic braking system machine consists of the following components to full fill the requirements of complete operation of the machine.

1. Brake pad
2. Wheel
3. IR Sensor
4. Pneumatic Cylinder
5. Solenoid Valve

### BLOCK DIAGRAM OF BRAKING SYSTEM



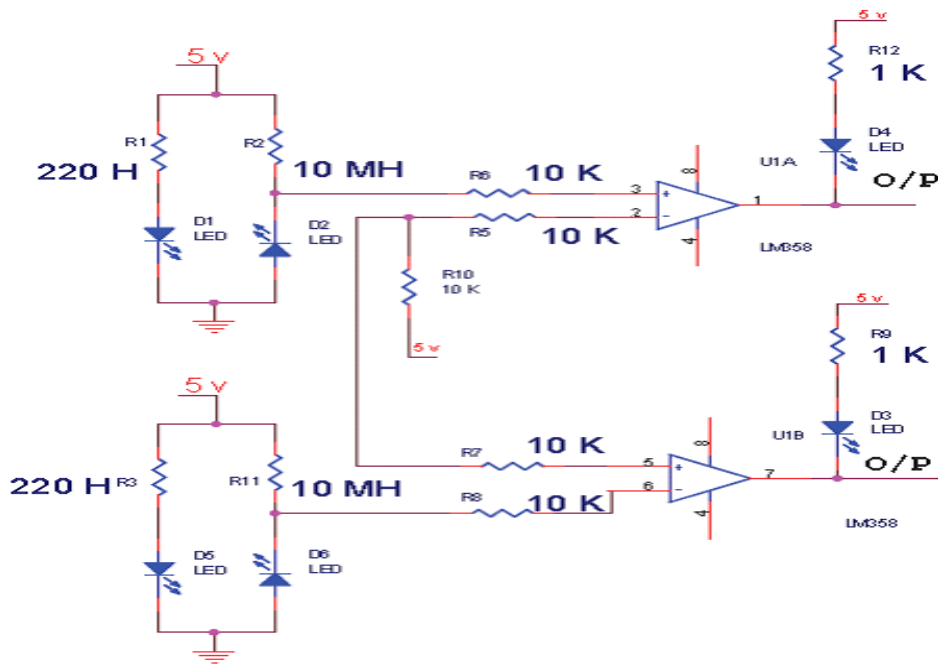
*Fig 4.1 Block diagram of braking system*

#### **AUTOMATIC DISC BRAKING SYSTEM**



*Fig 4.2 Automatic disc braking system*

## IR DETECTION

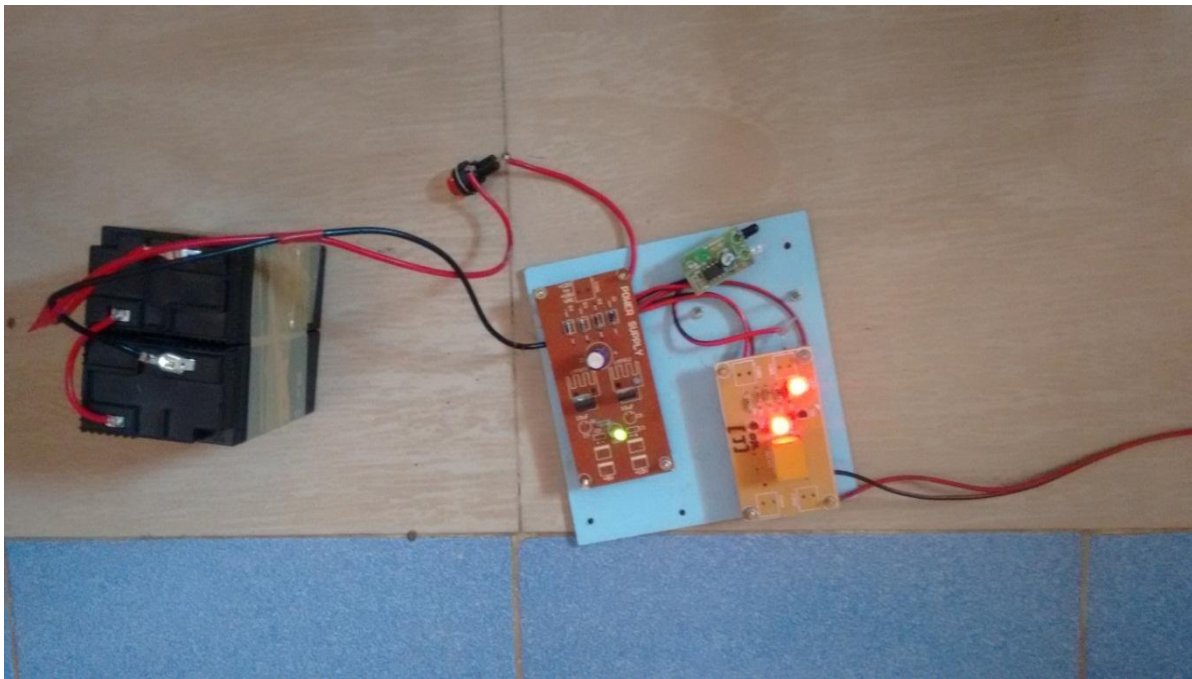


**Fig 4.3** Circuit of IR Sensor

This circuit is intended to control the heap. The heap might be engine or some other load. The heap is turned ON and OFF through hand-off. The hand-off ON and OFF is controlled by the combine of exchanging transistors (BC 547). The

transfer is associated in the Q2 transistor authority terminal. A Relay is only electromagnetic exchanging gadget which comprises of three pins. They are Common (3rd stick), Normally close (fifth stick) and Normally open (fourth stick).

## SENSOR CIRCUIT



**Fig 4.4** Sensor kit

**WORKING PRINCIPLE**

The IR sensor is fixed near the driving persons in two wheeler. The air tank contains the compressed air already filled. The IR sensor was ON at the time of emergency, the solenoid valve was activated. The solenoid valve stem is open, the compressed air flow from the air tank to the flow control valve.

The compressed air flow is controlled by the valve is called "flow control valve". This air flow is already set. Then the compressed air goes to the pneumatic cylinder. The pneumatic cylinder piston moves forward at the time of compressed air inlet to the cylinder.

The pneumatic cylinder moves towards the braking arrangement. Then the DISC braking liver is activated, so that the vehicle stops. Then the pneumatic cylinder piston moves backward.

**BENEFITS AND APPLICATIONS**  
**BENEFITS**

- Less power consumption
- Semi-skilled labors is sufficient to operate
- High safety
- Accidents can be avoided

**APPLICATIONS**

- It is recommended for two wheelers and four wheelers.
- It can be highly used in heavy load carrying trucks.

**LIST OF MATERIALS**  
**FACTORS DETERMINING THE CHOICE OF MATERIALS**

The various factors which determine the choice of material are discussed below.

**Properties**

The material selected must possess the necessary properties for the proposed application. The various requirements to

be satisfied and Can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.

The following four types of principle properties of materials decisively affect their selection

- Physical
- Mechanical
- From manufacturing point of view
- Chemical

The different physical properties concerned are softening point, thermal Conductivity, particular warmth, coefficient of warm extension, particular gravity, electrical conductivity, attractive purposes and so forth.

The different Mechanical properties Concerned are quality in tensile, Compressive shear, twisting, torsional and claspings load, exhaustion resistance, affect resistance, versatile point of confinement, perseverance cutoff, and modulus of flexibility, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.

**Manufacturing case:**

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

**Quality Required**

This by and large influences the assembling procedure and at last the material. For instance, it could never be



alluring to go throwing of a less number of parts which can be manufactured a great deal more monetarily by welding or hand fashioning the steel.

### **Availability of Material**

A few materials might be rare or hard to find, it then gets to be distinctly compulsory for the planner to utilize some other material which however may not be a flawless substitute for the material outlined. The conveyance of materials and the conveyance date of item ought to likewise be remembered.

### **Space consideration**

Some of the time high quality materials must be chosen on the grounds that the

strengths included are high and space impediments are there.

### **Fetches**

As in some other issue, in determination of material the cost of material has an essential influence and ought not be overlooked.

In some cases elements like piece usage, appearance, and non-upkeep of the composed part are included in the choice of legitimate materials. Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

## **COST ESTIMATION**

### **LABOUR COST**

Lathe+drilling+ welding+ drilling+ power hacksaw+ gas cutting cost=Rs.4000

### **MANUFACTURING COST:**

Manufacturing Cost =Material Cost + Labor Cost  
=4000+4000

=Rs.8000

Overhead charges =Rs.500

### **TOTAL COST**

Total cost = Material Cost +Labor Cost +Overhead charges

=4000+4000+500

=Rs.8500

Total cost for this project = Rs.8500

## **CONCLUSION**

This project is very useful in the field of automobile. There exist numerous accidents because of the carelessness of drivers. In case of heavy load vehicles like trucks the drivers travel a long distance they are at lack of sleep condition. It has been found that major accidents occur due to lack of sleep of drivers because of travelling long distance continuously. In that case automatic braking system is very useful it can reduce the amount of accidents occurring because of this. It is also very helpful during carelessness of

driver. It is very useful for drivers to drive the vehicle without tension.

This project has also reduced the cost involved in the concern. The project has been designed to perform the required task consuming minimum time.

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